

# PARTHA GHOSH

(+49) 1573 8340482 • [partha31415@gmail.com](mailto:partha31415@gmail.com) • [partha-ghosh.github.io](https://partha-ghosh.github.io)

## RESEARCH INTERESTS

My research interests are in Computer Vision and Robotics, specifically, 3D reconstruction, neural rendering, language-vision, scene understanding and parsing, with applications in autonomous driving, robotics and augmented reality.







## EDUCATION

- **University of Tübingen** Tübingen, Germany  
**M.Sc. in Machine Learning**, Grade: 1.2 (highest: 1.0, lowest: 5.0) Nov 2020 - Nov 2022
- **Indian Statistical Institute** Bangalore, India  
**B.Math. (Honours)**, Grade: 80%, First Division with Distinction Jul 2016 - Jul 2019

## EXPERIENCES

- **Aurivus** Ulm, Germany  
*Machine Learning Engineer* Mar 2023 -
  - Experimented and adopted various classical and learning-based mesh reconstruction algorithms for scene-level mesh reconstruction from large 3D scans.
  - Developed and implemented a technique for mesh instance segmentation from the reconstructed scene-level mesh.
  - Automated mesh texturing, mesh decimation and smoothing to generate optimized meshes.
  - Improved diameter and orientation prediction for pipes for MEP point clouds.
- **Autonomous Vision Group** Tübingen, Germany  
*Research Assistant* (Supervisor: Prof. Dr.-Ing. Andreas Geiger) Oct 2021 - Sep 2022
  - Collaborated with a group to develop a research paper recommender system.
  - Built machine learning models to highlight subsentences in the scientific abstracts based on their semantic meaning (i.e. task, problem, idea, result) to enable more efficient paper reading.
  - Experimented with various ideas employing different methods, pretraining schemes, input encodings with BERT and its variants from HuggingFace for sentence and word level classification, which led to performance improvement from 58% to 69% in accuracy.
  - For efficiency in inference, experimented with knowledge distillation from BERT to a smaller network.

## RESEARCH PROJECTS

- **Semi and Self-supervised Learning in Autonomous Driving**    May 2022 - Oct 2022  
Supervisors: Prof. Dr.-Ing. Andreas Geiger, Prof. Dr. Andreas Zell
  - Explored various semi-supervised and self-supervised learning approaches in autonomous driving.
  - Utilized raw, unlabeled, ego-centric driving videos from YouTube to pretrain the vision-backbone which led to improved driving performance.
  - Developed a novel semi-supervised driving approach based on deep visual odometry which improved route completion by a significant margin.
- **Non-watertight Mesh Reconstruction**    Dec 2021 - Jun 2022  
Supervisor: Prof. Dr.-Ing. Andreas Geiger
  - Extended 'Shape As Points', a learning-based watertight mesh reconstruction approach, to generate non-watertight meshes.
  - Developed a novel ML algorithm that employs semantic segmentation on the occupancy map to generate high quality non-watertight meshes from the given noisy, unoriented point clouds.
  - Demonstrated the efficacy of the method in reconstructing very accurate non-watertight meshes compared to the baseline techniques.

## ▪ **Extremely Lossy Image Compression**

Jun 2021 - Nov 2021

Supervisor: Prof. Dr. Robert Bamler

- Explored deep probabilistic compression models and performed Visual Question Answering (VQA) at various compression levels with a focus on extremely lossy image compression.
- Trained the compression models with and without supervision from the VQA task at various model specifications and analyze the qualitative and quantitative results.
- Our deep learning-based compression model, based on VAE with a scale hyperprior, achieved similar performance on the VQA task as the classical compression algorithms in the extremely lossy setting.

## ▪ **PyAnim**

Jul 2020 - Oct 2020

- Built this animation engine from scratch with Python/FFMPEG motivated by 3Blue1Brown's Manim.

## ▪ **Vertical Pen Plotter**

Dec 2018 - Jan 2019

- Built this drawing robot, using raspberry pi, stepper and servo motors.
- Wrote the software in Python from scratch to control the machine to draw on papers by parsing SVG images.

## TEACHING

---

- **Summer 2022:** Tutor for *Statistical Machine Learning* (taught by Prof. Ulrike von Luxburg)
- **Winter 2021:** Tutor for *Convex and Non-convex Optimization* (taught by Prof. Peter Ochs)
- **Summer 2019:** Mathematics Tutor at *Chegg*

## COURSEWORKS

---

- **Machine Learning:** Self-Driving Cars (1.0/1.0), Computer Vision (1.3/1.0), Deep Learning (1.0/1.0), Probabilistic Machine Learning (1.0/1.0), Statistical Machine Learning (1.3/1.0), Convex and Non-convex Optimization (1.0/1.0), Data Mining and Probabilistic Reasoning (1.0/1.0), Mathematics for Machine Learning (1.3/1.0)
- **Mathematics:** Linear Algebra, Multivariate Calculus, Optimization, Differential Geometry, Differential Equations, Graph Theory, Abstract Algebra, Real Analysis
- **Statistics:** Probability Theory, Data Reduction & Estimation, Statistical Inference, Linear Models & ANOVA, Decision Theory
- **Computer Science:** Algorithms and Data Structures, Programming in C, Numerical Methods
- **Physics:** Classical Mechanics, Thermal physics and Optics, Electromagnetism and Electrodynamics, Modern Physics and Quantum Mechanics

## AWARDS & ACHIEVEMENTS

---

- Awarded prize money of Rs 1200 for securing the second position in the third year of the B.Math. program.
- Received monthly stipend of Rs 3000 during the B.Math. program for maintaining excellent academic performance.

## SKILLS

---

- **Programming Languages:** Python, C/C++, MongoDB, SQL, HTML/CSS/JS
- **Libraries:** PyTorch, Tensorflow, Open3D, Trimesh, Transformers, NLTK, OpenCV, Scikit-learn, Pandas, Numpy, Matplotlib, Flask
- **Other Tools:** Git, Docker, Google Cloud, Linux, Slurm,  $\LaTeX$
- **Languages:** English (fluent), German (basic), Hindi (advanced), Bengali (native)

## REFERENCES

---

- Prof. Dr.-Ing. Andreas Geiger, University of Tübingen, Email: [a.geiger@uni-tuebingen.de](mailto:a.geiger@uni-tuebingen.de)
- Prof. Dr. Matthias Hein, University of Tübingen, Email: [matthias.hein@uni-tuebingen.de](mailto:matthias.hein@uni-tuebingen.de)
- Prof. Dr. Philipp Hennig, University of Tübingen, Email: [philipp.hennig@uni-tuebingen.de](mailto:philipp.hennig@uni-tuebingen.de)